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3 February 1998

AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM TECHNICAL PRESCRIPTIONS FOR WHEELED VEHICLES, EQUIPMENT AND PARTS WHICH CAN BE FITTED AND/OR BE USED ON WHEELED VEHICLES AND THE CONDITIONS FOR RECIPROCAL RECOGNITION OF APPROVALS GRANTED ON THE BASIS OF THESE PRESCRIPTIONS */

(Revision 2, including the amendments entered into force on 16 October 1995)

Addendum 12: Regulation No. 13

Revision 3 - Amendment 2

Incorporating:
09 series of amendments - Date of entry into force: 28 August 1996
Modifications to the 09 series of amendments subject of Depositary Notification C.N.223.1997.TREATIES-40 dated 23 June 1997
Additional modifications to the 09 series of amendments subject of Depositary Notification C.N.420.1997.TREATIES-90 dated 27 October 1997
Supplement 1 to the 09 series of amendments - Date of entry into force: 15 January 1997
Supplement 2 to the 09 series of amendments - Date of entry into force: 22 February 1997
Modifications to Supplement 2 to the 09 series of amendments subject of Depositary Notification C.N.224.1997.TREATIES-41 dated 20 June 1997
Modifications to Revision 3 subject of Depositary Notification C.N.419.1997.TREATIES-89 dated 27 October 1997

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES OF CATEGORIES M, N AND O WITH REGARD TO BRAKING

UNITED NATIONS

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*/ Former title of the Agreement:

Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958.

GE.98-20305

Text of the Regulation:

Paragraph 2.2.1.5., amend to read:

"2.2.1.5. A different type of braking equipment, with more particular reference to the presence or otherwise of equipment for braking a trailer, or any presence of an electric regenerative braking system;"

Paragraph 2.5., amend to read:

"2.5. "Transmission" means the combination of components comprised between the control and the brake and linking them functionally. The transmission may be mechanical, hydraulic, pneumatic, electric or mixed. Where the braking power is derived from or assisted by a source of energy independent of the driver but controlled by him, the reserve of energy in the system is likewise part of the transmission.

The transmission is divided into two independent functions: the control transmission and the energy transmission. Whenever the term "transmission" is used alone in this Regulation, it means both the "control transmission" and the "energy transmission". The control and supply lines between towing vehicles and trailers shall not be considered as parts of the transmission."

Insert new paragraphs 2.5.1. and 2.5.2., to read:

"2.5.1. "Control transmission" means the combination of the components of the transmission which control the operation of the brakes, including the control function and the necessary reserve(s) of energy.

2.5.2. "Energy transmission" means the combination of the components which supply to the brakes the necessary energy for their function, including the reserve(s) of energy necessary for the operation of the brakes."

Insert new paragraphs 2.20. to 2.20.6., to read:

"2.20. "Electric vehicle" means a vehicle in which the traction is effected only by (an) electric motor(s) acting at least on one axle.

2.20.1. "Electric regenerative braking system" means a braking system which allows the use of the vehicle's drive motor(s) to convert the vehicle's kinetic energy into electrical energy during deceleration.

2.20.2. "Electric regenerative braking control" means a device which modulates the action of the electric regenerative braking system.

2.20.3. "Electric regenerative braking system of category A" means an electric regenerative braking system which is not part of the service braking system.

2.20.4. "Electric regenerative braking systems of category B" means an electric regenerative braking system which is part of the service braking system.

2.20.5. "Electric state of charge" means the instantaneous ratio of electric quantity of energy stored in the traction battery relative to the maximum quantity of electric energy which could be stored in this battery.

2.20.6. "Traction battery" means an assembly of accumulators constituting the storage of energy used for powering the traction motor(s) of the vehicle."

Paragraphs 2.20. to 2.21. (former), renumber as paragraphs 2.21. and 2.22.

Insert new paragraphs 2.23. to 2.27.3., to read:

"2.23. "Electric control line" means the electrical connection between power-driven vehicle and trailer which provides the braking control function to the trailer. It comprises the electrical wiring and connector and includes the parts for data communication and the electrical energy supply for the trailer control transmission.

2.24. "Data communication" means the transfer of digital data under the rules of a protocol.

2.25. "Point-to-point" means a topology of a communication network with only two units. Each unit has an integrated termination resistor for the communication line.

2.26. "Coupling force control" means a system / function to balance automatically the braking rate of towing vehicle and trailer.

2.27. "Nominal value" definitions for braking reference performance are required to put a value on the transfer function of the braking system, relating output to input for vehicles individually and when used in combination.

2.27.1. "Nominal value" is defined, for a power-driven vehicle, as the characteristic which can be demonstrated at Type Approval and which relates the braking rate of the vehicle on its own to the level of the braking input variable.

2.27.2. "Nominal value" is defined, for a trailer, as the characteristic which can be demonstrated at Type Approval and which relates the braking rate to the coupling head signal.

2.27.3. "Nominal demand value" is defined, for coupling force control, as the characteristic which relates the coupling head signal to the braking rate and which can be demonstrated at Type Approval, within the limits of the compatibility bands of annex 10."

Paragraph 4.2., amend to read:

"4.2. An approval number shall be assigned to each type approved, its first two digits (at present 09) shall indicate the series of amendments ...."

Insert new paragraphs 5.1.1.4. to 5.1.1.6., to read:

"5.1.1.4. The effectiveness of the braking systems, including the electric control line, shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by compliance with Regulation No. 10, 02 series of amendments.

5.1.1.5. It shall be possible to generate maximum braking forces under static conditions on a rolling road or roller brake tester.

5.1.1.6. A failure detection signal may interrupt momentarily (< 10 ms) the demand signal in the control transmission, provided that the braking performance is thereby not reduced."

Paragraph 5.1.2.4. should be deleted.

Insert new paragraphs 5.1.3. to 5.1.3.8., to read:

"5.1.3. Connections, for compressed-air braking systems, between power-driven vehicles and trailers

5.1.3.1. The connections of the compressed-air braking systems between power-driven vehicles and trailers shall be provided according to paragraphs 5.1.3.1.1., 5.1.3.1.2. or 5.1.3.1.3.:

5.1.3.1.1. One pneumatic supply line and one pneumatic control line;

5.1.3.1.2. One pneumatic supply line, one pneumatic control line and one electric control line;

5.1.3.1.3. One pneumatic supply line and one electric control line; this option is subject to footnote. 4/

5.1.3.2. The electric control line of the power-driven vehicle shall provide information as to whether the requirements of paragraph 5.2.1.18.2. can be satisfied by the electric control line, without assistance from the pneumatic control line. It

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4/ Until uniform technical standards have been agreed, which ensure compatibility and safety, connections between power-driven vehicles and trailers conforming to paragraph 5.1.3.1.3. shall not be permitted.

shall also provide information as to whether it is equipped according to paragraph 5.1.3.1.2. with two control lines or according to paragraph 5.1.3.1.3. with only an electric control line.

5.1.3.3. A power-driven vehicle equipped according to paragraph 5.1.3.1.3. shall recognize that the coupling of a trailer equipped according to paragraph 5.1.3.1.1. is not compatible. When such vehicles are electrically connected via the electric control line of the towing vehicle, the driver shall be warned by the red optical warning signal specified in paragraph 5.2.1.29.1.1. and when the system is energized, the brakes on the towing vehicle shall be automatically applied. This brake application shall provide at least the prescribed parking braking performance required by paragraph 2.3.1. of annex 4 to this Regulation.

5.1.3.4. In the case of a power-driven (towing) vehicle equipped with two control lines as defined in paragraph 5.1.3.1.2., both control signals shall be present at the coupling head and connector. When such a power-driven vehicle is electrically connected to a trailer which is also equipped with two control lines as defined in paragraph 5.1.3.1.2., both signals shall be present at the trailer, and the trailer shall decide which control signal to use. If there is an electric control signal at the trailer which is not accompanied by a corresponding pneumatic control signal when the service braking control is applied, the driver shall be warned, from the trailer, by the separate yellow warning signal specified in paragraph 5.2.1.29.2.

5.1.3.5. A trailer may be equipped as defined in paragraph 5.1.3.1.3., provided that it can only be operated in conjunction with a power-driven vehicle with an electric control line which satisfies the requirements of paragraph 5.2.1.18.2. In any other case, the trailer, when electrically connected, shall automatically apply the brakes or remain braked. The driver shall be warned by the separate yellow warning signal specified in paragraph 5.2.1.28.2.

5.1.3.6. The electric control line shall conform to ISO/DIS 11992-1 and 11992-2:[1996] and be a point-to-point type using the seven pin connector ISO/DIS7638:1996. */ Nevertheless, other information may be transferred by this line provided that this conforms to ISO/DIS 11992-3:[1996] and that braking functions have priority and are maintained in the normal and failed modes. The transmission of other information shall not delay braking functions.

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*/ The ISO/DIS 7638:1996 connector may be used for 5 pin or 7 pin applications, as appropriate.

5.1.3.6.1. When a power-driven vehicle is equipped with an electric control line and electrically connected to a trailer equipped with an electric control line, a continuous failure (> 40 ms) within the electric control line shall be detected in the power-driven vehicle and shall be signalled to the driver by the yellow warning signal specified in paragraph 5.2.1.29.1.2., when such vehicles are connected via the electric control line.

5.1.3.7. If the operation of the parking braking system on the power-driven vehicle also operates a braking system on the trailer, as permitted by paragraph 5.1.2.3., then the following additional requirements shall be met:

5.1.3.7.1. When the power-driven vehicle is equipped according to paragraph 5.1.3.1.1., the actuation of the parking brake system of the power-driven vehicle shall actuate a braking system on the trailer via the pneumatic control line.

5.1.3.7.2. When the power-driven vehicle is equipped according to paragraph 5.1.3.1.2., the actuation of the parking brake system on the power-driven vehicle shall actuate a braking system on the trailer as prescribed in paragraph 5.1.3.7.1. In addition, the actuation of the parking brake system may also actuate a braking system on the trailer via the electric control line.

5.1.3.7.3. When the power-driven vehicle is equipped according to paragraph 5.1.3.1.3. or, if it satisfies the requirements of paragraph 5.2.1.18.2. without assistance from the pneumatic control line, paragraph 5.1.3.1.2., the actuation of the parking braking system on the power-driven vehicle shall actuate a braking system on the trailer via the electric control line. When the electrical energy for the braking equipment of the power-driven vehicle is switched off, the braking of the trailer shall be effected by evacuation of the supply line (in addition, the pneumatic control line may remain pressurised); the supply line may only remain evacuated until the electrical energy for the braking equipment of the power-driven vehicle is restored and simultaneously the braking of the trailer via the electric control line is restored.

5.1.3.8. Shut-off devices which are not automatically actuated shall not be permitted. In the case of articulated vehicle combinations, the flexible hoses and cables shall be a part of the power-driven vehicle. In all other cases, the flexible hoses and cables shall be a part of the trailer."

Paragraph 5.2.1.4.2., amend to read:

"5.2.1.4.2. The failure of a part of a hydraulic transmission system shall be signalled to the driver by a device comprising a red warning signal, as specified in paragraph 5.2.1.29.1.1. Alternatively, the lighting up of this device when the fluid in the reservoir

is below a certain level specified by the manufacturer shall be permitted."

Paragraphs 5.2.1.7., 5.2.1.8., and 5.2.1.9., amend to read:

"5.2.1.7. The service braking system:

5.2.1.7.1. shall act on all the wheels of the vehicle;

5.2.1.7.2. shall distribute its action appropriately among the axles; in the case of vehicles with more than two axles, in order to avoid wheel-locking or glazing of the brake linings, the brake force on certain axles may be reduced to zero automatically when carrying a much reduced load, provided that the vehicle meets all the performance requirements prescribed in annex 4 to this Regulation.

5.2.1.8. The action of the service braking system shall be distributed between the wheels of one and the same axle symmetrically in relation to the longitudinal median plane of the vehicle. Compensation and functions, such as anti-lock, which may cause deviations from this symmetrical distribution, and functions, such as traction control, which may cause application of the brakes not directly controlled by the driver, shall be declared. 5/

5.2.1.8.1. Compensation by the electric control transmission for deterioration or defect within the braking system shall be indicated to the driver by means of the yellow warning signal specified in paragraph 5.2.1.29.1.2. This requirement shall apply for all conditions of loading when compensation exceeds the following limits:

5.2.1.8.1.1. a difference in transverse braking pressures on any axle:

(a) of 25 per cent of the higher value for vehicle decelerations $\geq 2 m/sec^2$,

(b) a value corresponding to 25 per cent at $2 m/sec^2$ for decelerations below this rate.

5.2.1.8.1.2. an individual compensating value on any axle:

(a) > 50 per cent of the nominal value for vehicle decelerations $\geq 2 m/s^2$,

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5/ Adequate performance specifications and the associated test procedures shall be presented by the manufacturer and shall be subject to discussion and agreement by the Technical Service (unless already covered by the present Regulation). For this purpose, the manufacturer shall provide documentation which covers: system layout, description of functions and safety concept.

(b) a value corresponding to 50 per cent of the nominal value at $2 m/s^2$ for decelerations below this rate.

5.2.1.8.2. Compensation as defined above, is permitted only when the initial brake application is made at vehicle speeds greater than 10 km/h.

5.2.1.9. Malfunctions of the electric control transmission shall not apply the brakes contrary to the driver's intentions."

Paragraph 5.2.1.11.2., add at the end the following text:

"5.2.1.11.2. .....
The yellow warning signal specified in paragraph 5.2.1.29.1.2. may be used as the optical warning signal."

Paragraph 5.2.1.12., amend to read:

"5.2.1.12. In hydraulic transmission braking systems ... without the receptacles having to be opened. If this latter condition is not fulfilled, the red warning signal specified in paragraph 5.2.1.29.1.1. shall draw the driver's attention to any fall in the level of reserve fluid liable to cause a failure of the braking system. The type of fluid to be used ... may be provided by the manufacturer."

Paragraphs 5.2.1.13.1. and 5.2.1.13.1.1., add at the end the following text:

"5.2.1.13.1. .... The red warning signal specified in paragraph 5.2.1.29.1.1. shall be used as the optical warning signal.

5.2.1.13.1.1. .... The red warning signal specified in paragraph 5.2.1.29.1.1. shall be used as the optical warning signal."

Paragraph 5.2.1.16., amend to read:

"5.2.1.16. If the pneumatic/hydraulic auxiliary equipment ...."

Paragraph 5.2.1.18.3, amend to read:

"5.2.1.18.3. In the event of a failure (e.g. breakage of or leak) in one of the pneumatic connecting lines, interruption or defect in the electric control line, it shall nevertheless be possible for the driver fully or partially to actuate the brakes of the trailer by means either of the service braking control or of the secondary braking control or of the parking braking control, unless the failure automatically causes the trailer to be braked with the performance prescribed in paragraph 3.3. of annex 4 to this Regulation."

Paragraph 5.2.1.18.4., amend to read:

"5.2.1.18.4. The automatic braking in paragraph 5.2.1.18.3. above shall be considered to be met when the following conditions are fulfilled:"

Insert a new paragraph 5.2.1.18.5., to read:

"5.2.1.18.5. In the event of a fa'lure in one of the control lines connecting two vehicles equipped according to paragraph 5.1.3.1.2., the control line not affected by the failure shall automatically ensure the braking performance prescribed for the trailer in paragraph 3.1. of annex 4."

Paragraph 5.2.1.19., amend to read:

"5.2.1.19. In the case of a power-driven vehicle equipped to draw a trailer with electrical braking system, according to paragraph 1.1. of annex 14 to this Regulation, the following requirements shall be met:"

Paragraph 5.2.1.24., amend to read:

"5.2.1.24. Power-driven vehicles authorized to tow a trailer equipped with an anti-lock system shall also be equipped with a special electrical connector, conforming to ISO/DIS 7638:1996 */, for the electric control transmission and/or the anti-lock systems of trailers."

Insert new paragraphs 5.2.1.25. to 5.2.1.25.4., to read:

"5.2.1.25. Additional requirements for electric vehicles of categories M_1, M_2, N_1 and category N_2 < 5 tonnes.

5.2.1.25.1. Electric vehicles fitted with an electric regenerative braking system of category A

5.2.1.25.1.1. The electric regenerative braking shall only be actuated by the accelerator control and/or the gear selector neutral position for vehicles of category M_1 or N_1.

5.2.1.25.1.2. In addition, for vehicles of categories M_2 and N_2 (< 5 tonnes), the electric regenerative braking control can be a separate switch or lever.

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*/ The ISO/DIS 7638:1996 connector may be used for 5 pin or 7 pin applications, as appropriate.

5.2.1.25.2. Electric vehicles fitted with an electric regenerative braking system of category B

5.2.1.25.2.1. It shall not be possible to disconnect partially or totally one part of the service braking system other than by an automatic device.

5.2.1.25.2.2. The service braking system shall have only one control device.

5.2.1.25.2.3. For electric vehicles fitted with an electric regenerative braking system of both categories, all the relevant prescriptions shall apply except paragraph 5.2.1.25.1.1.

In this case, the electric regenerative braking may be actuated by the accelerator control and/or the gear selector neutral position for vehicles of category M_1 or N_1.

Additionally, the action on the service braking control must not reduce the above braking effect generated by the release of accelerator control.

5.2.1.25.2.4. The service braking system shall not be adversely affected by the disengagement of the motor(s) or by the gear ratio used.

5.2.1.25.2.5. If the operation of the electric component of braking is ensured by a relation established between the informatic.. coming from the control of the service brake and the braking force at the respective wheels, a failure of this relation leading to the modification of the braking distribution among the axles (annex 10 or 13, whichever is applicable) must be signalled to the driver by an optical warning signal at the latest at the moment when the control is actuated and this signal shall remain lit as long as this defect exists and that the vehicle control switch (key) is in the "ON" position.

5.2.1.25.3. The operation of the electric regenerative braking must not be adversely affected by magnetic or electric fields.

5.2.1.25.4. For vehicles equipped with an antilock device, the antilock device shall control the electric regenerative braking system."

Insert new paragraphs 5.2.1.26. to 5.2.1.29.5., to read:

"5.2.1.26. Special additional requirements for the electric transmission of the par ing braking system.

5.2.1.26.1. In the case of a failure within the electric transmission, any unintended actuation of the parking braking system shall be prevented.

5.2.1.26.2. In the case of a break in the wiring within the electric control transmission, it shall remain possible to apply the parking braking system from the driver's seat and achieve the

parking braking performance specified in paragraph 2.3.1. of annex 4 to this Regulation. It shall also be possible to release the parking braking system, if necessary by the use of an auxiliary release device carried/fitted on the vehicle. In the case of vehicles of categories M_1 and N_1 the engine/manual transmission or the automatic transmission (park position) may be used to achieve the above performance.

5.2.1.26.2.1. A break in the supply of electricity and/or in the wiring within the electric transmission of the parking braking system shall be signalled to the driver by the yellow warning signal specified in paragraph 5.2.1.29.1.2.

5.2.1.26.3. Auxiliary equipment may draw its energy from the energy reserve of the electric transmission of the parking braking system, provided that the actuation of the parking braking system will not be affected. In addition, where the energy reserve is also used by the service braking system, the requirements of paragraph 5.2.1.27.7. shall apply.

5.2.1.26.4. After the ignition/start switch which controls the electrical energy for the braking equipment has been switched off and/or the key removed, it shall remain possible to apply the parking braking system, whereas releasing shall be prevented.

5.2.1.27. Special additional requirements for service braking systems with electric control transmission.

5.2.1.27.1. With the parking brake released, the service braking system shall be able to generate a static total braking force at least equivalent to that produced during the Type-0 test, even when the ignition/start switch has been switched off and/or the key has been removed. In the case of power-driven vehicles authorized to tow trailers of category O_3 or O_4, such vehicles shall provide a full control signal for the service braking system of the trailer. It should be understood that sufficient energy is available in the energy transmission of the service braking system.

5.2.1.27.2. In the case of a single temporary failure (< 40 ms) within the electric control transmission (e.g. non-transmitted signal or data error) there shall be no distinguishable effect on the service braking performance.

5.2.1.27.3. A continuous failure (≥ 40 ms) within the electric control transmission 6/, excluding its energy reserve shall be

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6/ Until uniform test procedures have been agreed, the manufacturer shall provide the Technical Service with an analysis of potential failures within the control transmission and their effects. This information shall be subject to discussion and agreement between the Technical Service and the vehicle manufacturer.

indicated to the driver by the red or yellow warning signal specified in paragraphs 5.2.1.29.1.1. and 5.2.1.29.1.2., respectively, as appropriate. When the prescribed service braking performance can no longer be achieved (red warning signal), failures resulting from a loss of electrical continuity (eg. breakage, disconnection) shall be signalled to the driver as soon as they occur, and the prescribed residual braking performance shall be fulfilled by operating the service braking control in accordance with paragraph 2.4. of annex 4 to this Regulation. These requirements shall not be construed as a departure from the requirements concerning secondary braking.

5.2.1.27.4. A power-driven vehicle, electrically connected to a trailer via an electric control line, shall provide a clear warning to the driver whenever the trailer provides the failure information that the stored energy in any part of the service braking system on the trailer falls below the warning level, as specified in paragraph 5.2.2.16. below. A similar warning shall also be provided when a continuous failure (> 40 ms) within the electric control transmission of the trailer, excluding its energy reserve, precludes achievement of the prescribed service braking performance of the trailer, as specified in paragraph 5.2.2.15.2.1. below. The red warning signal specified in paragraph 5.2.1.29.2.1. shall be used for this purpose.

5.2.1.27.5. In the event of a failure of the energy source of the electric control transmission, starting from the nominal value of the energy level, the full control range of the service braking system shall be guaranteed after twenty consecutive full stroke actuations of the service braking control. During the test, the braking control shall be fully applied for 20 seconds and released for 5 seconds on each actuation. It should be understood that during the above test sufficient energy is available in the energy transmission to ensure full actuation of the service braking system. This requirement shall not be construed as a departure from the requirements of annex 7.

5.2.1.27.6. When the battery voltage falls below a value nominated by the manufacturer at which the prescribed service braking performance can no longer be guaranteed and/or which precludes at least two independent service braking circuits from each achieving the prescribed secondary or residual braking performance, the red warning signal specified in paragraph 5.2.1.29.1.1. shall be activated. After the warning signal has been activated, it shall be possible to apply the service braking control and obtain at least the residual performance prescribed in paragraph 2.4. of annex 4 to this Regulation. It should be understood that sufficient energy is available in the energy transmission of the service braking system. This requirement shall not be construed as a departure from the requirement concerning secondary braking.

5.2.1.27.7. If the auxiliary equipment is supplied with energy from the electric control transmission, the supply of the energy shall be sufficient to fulfil the prescribed deceleration values when all the auxiliary equipment is functioning. During the test, the energy consumption of the trailer shall be simulated by a load of 400 W. With the engine running at a speed not greater than 80 per cent of the maximum power speed, the electric control transmission energy reserve shall not be discharged unless the prescribed deceleration values can be reached without the use of electrical energy. Compliance with this requirement may be demonstrated by calculation or by a practical test.

5.2.1.27.8. If the auxiliary equipment is supplied with energy from the electric control transmission, the following requirements shall be fulfilled.

5.2.1.27.8.1. In the event of a failure in the energy source, whilst the vehicle is in motion, the energy in the reservoir shall be sufficient to actuate the brakes when the control is applied.

5.2.1.27.8.2. In the event of a failure in the energy source, whilst the vehicle is stationary and the parking braking system applied, the energy in the reservoir shall be sufficient to actuate the lights even when the brakes are applied.

5.2.1.27.9. In the case of a failure in the electric control transmission of the service braking system of a towing vehicle equipped with an electric control line according to paragraph 5.1.3.1.2. or 5.1.3.1.3., the full actuation of the brakes of the trailer shall remain ensured.

5.2.1.27.10. In the case of a failure in the electric control transmission of a trailer, electrically connected via an electric control line only, according to paragraph 5.1.3.1.3., a full actuation of the brakes of the trailer shall be ensured by pressure drop in the pneumatic supply line.

5.2.1.28. Special requirements for coupling force control.

5.2.1.28.1. Coupling force control shall only be permitted in the towing vehicle.

5.2.1.28.2. The action of the coupling force control shall be to reduce the difference between the dynamic braking rates of towing and towed vehicles.

5.2.1.28.2.1. The coupling force control may control the braking rate T_M/P_M, the pneumatic control line pressure at the coupling head p_m and/or the corresponding electric brake demand value for the trailer. In the case of a towing vehicle equipped with two control lines according to paragraph 5.1.3.1.2., both control signals have to correspond to each other.

5.2.1.28.2.2. The coupling force control shall not prevent the maximum possible braking pressure(s) from being applied.

5.2.1.28.3. The vehicle shall fulfil the laden compatibility requirements of annex 10, but to achieve the objectives of paragraph 5.2.1.28.2. the vehicle may deviate from these requirements when the coupling force control is in operation.

5.2.1.28.4. A coupling force control failure shall be detected and indicated to the driver by a yellow warning signal such as that specified in paragraph 5.2.1.29.1.2. In the event of a failure the relevant requirements of annex 10 shall be fulfilled.

5.2.1.28.5. Compensation by the coupling force control system shall be indicated by means of the yellow warning signal specified in paragraph 5.2.1.29.1.2. if this compensation exceeds ± 1.5 bar away from the nominal demand value defined in paragraph 2.27.3. up to a limit, in p_m, of 6.5 bar (or the equivalent digital demand). Above the level of 6.5 bar the warning shall be given if the compensation causes the operating point to lie outside the laden compatibility band as specified in annex 10 for the motor vehicle.

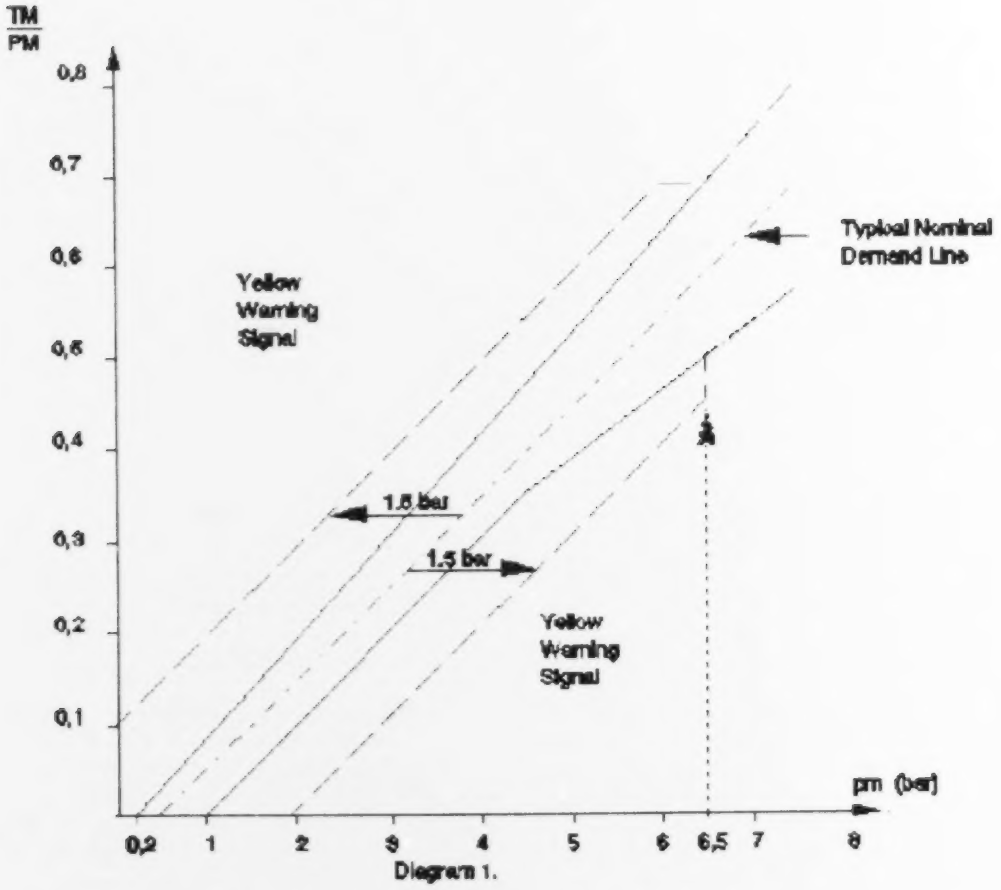

Diagram 1.

Towing Vehicles for Trailers (except semi-trailers)

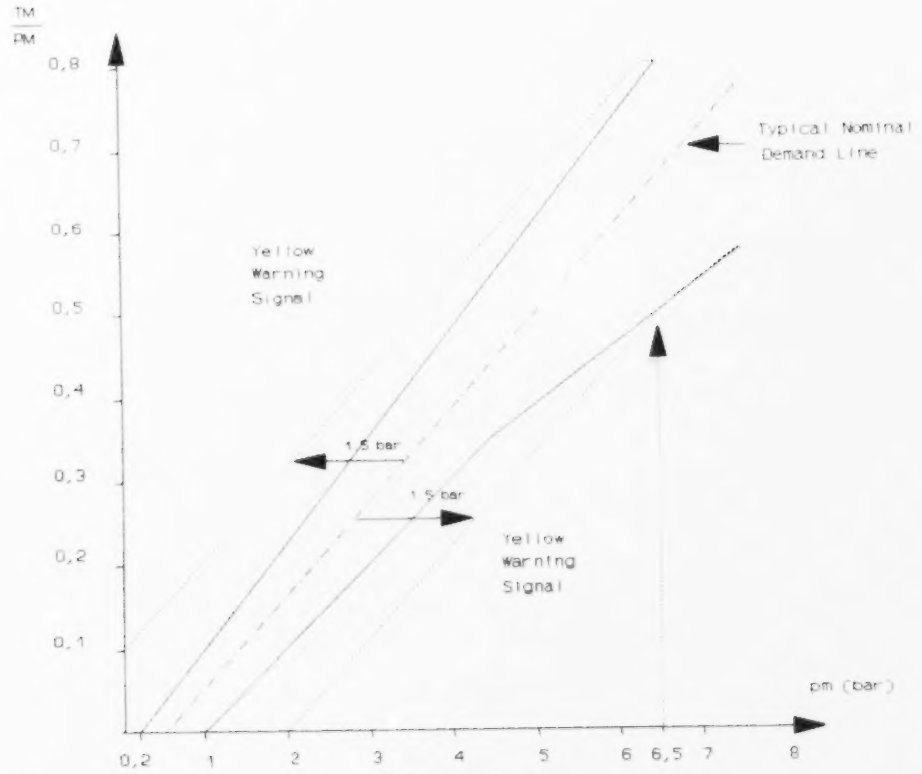

DIAGRAM 2
Tractive Units for Semi-trailers

5.2.1.28.6. A coupling force control system shall control only the coupling forces generated by the service braking system of the motor vehicle and the trailer, excluding endurance braking systems. Coupling forces resulting from the performance of endurance braking systems shall not be compensated by the service braking system. It is considered that endurance braking systems are not part of the service braking systems.

5.2.1.29. Brake failure and defect warning signals (general requirements).

5.2.1.29.1. Power-driven vehicles shall be capable of providing optical brake failure and defect warning signals, as follows:

5.2.1.29.1.1. a red warning signal, indicating a failure within the vehicle braking equipment which precludes achievement of the prescribed service braking performance and/or which precludes the functioning of at least one of two independent service braking circuits.

5.2.1.29.1.2. where applicable, a yellow warning signal indicating an electrically detected defect within the vehicle braking equipment, which is not indicated by the red warning signal described in paragraph 5.2.1.29.1.1. above.

5.2.1.29.2. With the exception of vehicles of categories M_1 and N_1, power-driven vehicles equipped with an electric control line and/or authorised to tow a trailer equipped with electric control transmission and/or an anti-lock braking system, with the exception of vehicles of categories M_1 and N_1, shall be capable of providing a separate yellow warning signal to indicate a defect within the anti-lock braking system and/or electric control transmission of the braking equipment of the trailer. The signal shall be activated from the trailer via pin 5 of the electrical connector conforming to ISO/DIS 7638:1996. */ This warning signal shall not light up when coupled to a trailer without an electric control line and/or electric control transmission and/or an anti-lock braking system or when no trailer is coupled. This function shall be automatic.

5.2.1.29.2.1. In the case of a power-driven vehicle equipped with an electric control line, when electrically connected to a trailer with an electric control line, the red warning signal specified in paragraph 5.2.1.29.1.1. above shall also be used to indicate certain specified failures within the braking equipment of the trailer, whenever the trailer provides corresponding failure information via the data communication part of the electric control line. This indication shall be in addition to the yellow warning signal specified in paragraph 5.2.1.29.2. above. Alternatively, instead of utilizing the red warning signal specified in paragraph 5.2.1.29.1.1. and the accompanying yellow warning signal above, a separate red warning signal may be provided in the towing vehicle to indicate such a failure within the braking equipment of the trailer.

5.2.1.29.3. The warning signals shall be visible, even by daylight; the satisfactory condition of the signals shall be easily verifiable by the driver from the driver's seat; the failure of a component of the warning devices shall not entail any loss of the braking system's performance.

5.2.1.29.4. A specified failure or defect shall be signalled to the driver by the above-mentioned warning signal(s) not later than on actuation of the service braking control. The warning signal(s) shall remain displayed as long as the failure/defect persists and the ignition (start) switch is in the "on" (run) position.

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*/ The ISO/DIS 7638:1996 connector may be used for 5 pin or 7 pin applications, as appropriate.

5.2.1.29.5. The warning signal(s) mentioned above shall light up when the electrical equipment of the vehicle (and the braking system) is energized. With the vehicle stationary, the braking system shall verify that none of the specified failures or defects are present before extinguishing the signals. Specified failures or defects which should activate the warning signals mentioned above, but which are not detected under static conditions, shall be stored upon detection and be displayed at start-up and at all times when the ignition (start) switch is in the "on" (run) position, as long as the failure or defect persists."

Paragraphs 5.2.2.4. to 5.2.2.6., amend to read:

"5.2.2.4. The service braking system:

5.2.2.4.1. shall act on all the wheels of the vehicle;

5.2.2.4.2. shall distribute its action appropriately among the axles.

5.2.2.5. The action of the service braking system shall be distributed between the wheels of one and the same axle symmetrically in relation to the longitudinal median plane of the vehicle. Compensation and functions such as anti-lock, which may cause deviations from this symmetrical distribution, and functions, which may cause application of the brakes not directly controlled by the driver, shall be declared. 7/

5.2.2.5.1. Compensation by the electric control transmission for deterioration or defect within the braking system shall be indicated to the driver by means of the separate yellow optical warning signal specified in paragraph 5.2.1.29.2. This requirement shall apply for all conditions of loading when compensation exceeds the following limits:

5.2.2.5.1.1. a difference in transverse braking pressures on any axle:

(a) of 25 per cent of the higher value for vehicle decelerations $\geq 2 m/sec^2$,

(b) a value corresponding to 25 per cent at $2 m/sec^2$ for decelerations below this rate.

7/ Adequate performance specifications and the associated test procedures shall be presented by the manufacturer and shall be subject to discussion and agreement by the Technical Service (unless already covered by the present Regulation). For this purpose, the manufacturer shall provide documentation which covers: system layout, description of functions and safety concept.

5.2.2.5.1.2. an individual compensating value on any axle:

(a) > 50 per cent of the nominal value for vehicle decelerations ≥ 2 m/s^2,

(b) a value corresponding to 50 per cent of the nominal value at 2m/s^2 for decelerations below this rate.

5.2.2.5.2. Compensation as defined above, is permitted only when the initial brake application is made at vehicle speeds greater than 10 km/h.

5.2.2.6. Malfunctions of the electric control transmission shall not apply the brakes contrary to the driver's intentions;"

Paragraph 5.2.2.8.1., footnote 4/ pertinent to this paragraph and the reference to this footnote, renumber as footnote 8/.

Paragraph 5.2.2.12., amend to read:

"5.2.2.12. Trailers of categories O_3 and O_4 shall satisfy the conditions specified in paragraph 5.2.1.18.4.2.

5.2.2.12.1. In the case of trailers equipped with an electric control line and electrically connected to a towing vehicle with an electric control line the automatic braking action specified in paragraph 5.2.1.18.4.2. may be suppressed as long as the pressure in the compressed air reservoirs of the trailer is sufficient to ensure the braking performance specified in paragraph 3.3 of annex 4 to this Regulation."

Insert new paragraphs 5.2.2.15. to 5.2.2.20., to read:

"5.2.2.15. Special additional requirements for service braking systems with electric control transmission.

5.2.2.15.1. In the case of a single temporary failure (< 40 ms) within the electric control transmission (e.g. non-transmitted signal or data error) there shall be no distinguishable effect on the service braking performance.

5.2.2.15.2. In the case of a continuous failure (≥ 40 ms) within the electric control transmission (e.g. breakage, disconnection), a braking performance of at least 30 per cent of the prescribed performance for the service braking system of the relevant trailer shall be maintained.

5.2.2.15.2.1. A continuous failure (> 40 ms) within the electric control transmission of the trailer, excluding its energy reserve, shall be indicated to the driver by the separate warning signal specified in paragraph 5.2.1.29.2. via pin 5 of the electrical

connector conforming to ISO/DIS 7638:1996. */ In addition, trailers equipped with an electric control line, when electrically connected to a towing vehicle with an electric control line, shall provide the failure information for activation of the red warning signal specified in paragraph 5.2.1.29.2.1. via the data communication part of the electric control line, when the prescribed service braking performance of the trailer can no longer be ensured.

5.2.2.16. When the stored energy in any part of the service braking system of a trailer equipped with an electric control line and electrically connected to a towing vehicle with an electronic control line falls to the value determined in accordance with paragraph 5.2.2.16.1. below, a warning shall be provided to the driver of the towing vehicle. The warning shall be provided by activation of the red signal specified in paragraph 5.2.1.29.2.1. and the trailer shall provide the failure information via the data communication part of the electric control line. The separate yellow warning signal specified in paragraph 5.2.1.29.2. shall also be activated via pin 5 of the electrical connector conforming to ISO/DIS 7638:1996 */, to indicate to the driver that the low-energy situation is on the trailer.

5.2.2.16.1. The low energy value referred to in paragraph 5.2.2.16. above shall be that at which, without re-charging of the energy reservoir and irrespective of the load condition of the trailer, it is not possible to apply the service braking control a fifth time after four full-stroke actuations and obtain at least 50 per cent of the prescribed performance of the service braking system of the relevant trailer.

5.2.2.17. Trailers equipped with an electric control line and O_3 and O_4 category trailers equipped with an anti-lock system, shall be fitted with a special electrical connector for the braking system and/or anti-lock system, conforming to ISO/DIS 7638:1996. 9/*/ Failure warning signals required from the trailer by this Regulation shall be activated via the above connector. The warning signal shall be displayed when the electric part of the braking equipment of the trailer is energized and the braking system shall verify that none of the defects which are required to be indicated by this signal are present before extinguishing the signal.

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*/ The ISO/DIS 7638:1996 connector may be used for 5 pin or 7 pin applications, as appropriate.

9/ The wiring specifications of ISO/DIS 7638:1996 for the trailer not equipped with an electronic control transmission may be reduced if the trailer is installed with its own independent fuse. The rating of the fuse shall be such that the current rating of the conductors is not exceeded.

5.2.2.18. In addition to the requirements specified in paragraph 5.1.3.6., the electrical power supplied by the ISO/DIS 7638:1996 */ connector may be used for non-braking systems/functions provided that the braking system is protected from an overload external to the braking system. This protection shall be a function of the braking system.

5.2.2.19. In the case of a failure in one of the control lines connecting two vehicle equipped according to paragraph 5.1.3.1.2. the trailer shall use the control line not affected by the failure to ensure, automatically, the braking performance prescribed for the trailer in paragraph 3.1. of annex 4.

5.2.2.20. When the supply voltage to the trailer falls below a value nominated by the manufacturer at which the prescribed service braking performance can no longer be guaranteed, the separate yellow warning signal specified in paragraph 5.2.1.29.2. shall be activated via pin 5 of the ISO/DIS 7638:1996 */ connector. In addition, trailers equipped with an electrical control line, when electrically connected to a towing vehicle with an electric control line, shall provide the failure information for actuation of the red warning signal specified in paragraph 5.2.1.29.2.1. via the data communication part of the electric control line."

Paragraph 12., amend to read:

"12. TRANSITIONAL PROVISIONS

12.1. General

12.1.1. As from the official date of entry into force of the 09 series of amendments, no Contracting Party applying this Regulation shall refuse to grant approval under this Regulation as amended by the 09 series of amendments.

12.1.2. New type approvals

12.1.2.1. Subject to the provisions of paragraph 12.2., as from 1 October 1996 Contracting Parties applying this Regulation shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by the 08 or 09 series of amendments.

12.1.2.2. Subject to the provisions of paragraph 12.2., as from 1 October 1998 Contracting Parties applying this Regulation shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by the 09 series of amendments.

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*/ The ISO/DIS 7638:1996 connector may be used for 5 pin or 7 pin applications, as appropriate.

12.1.3. Limit of validity of old type approvals

12.1.3.1. Subject to the provisions of paragraphs 12.1.3.3. and 12.2., approvals granted to this Regulation, as amended by the 06 or 07 series of amendments, shall cease to be valid on 1 October 1998 unless the Contracting Party which granted the approval notifies the other Contracting Parties applying this Regulation that the vehicle type approved meets the requirements of this Regulation as amended by the 08 or 09 series of amendments.

12.1.3.2. Subject to the provisions of paragraphs 12.1.3.3. and 12.2., approvals granted to this Regulation, as amended by the 08 series of amendments, shall cease to be valid on 1 October 2000 unless the Contracting Party which granted the approval notifies the other Contracting Parties applying this Regulation that the vehicle type approved meets the requirements of this Regulation as amended by the 09 series of amendments.

12.1.3.3. For vehicles of category M_1 and N_1, approvals granted to the 06 series of amendments to this Regulation before 1 July 1995 and any extensions of approvals issued subsequently shall remain valid until 1 April 2001. However this derogation does not extend to the requirements contained in paragraph 5.1.1.3. of this Regulation which shall apply to all new vehicles from 1 October 1998.

12.2. Anti-lock braking devices.

In place of the dates specified in paragraphs 12.1.2. and 12.1.3., the requirement for anti-lock braking devices mentioned in paragraphs 5.2.1.22. and 5.2.2.13., as amended by the 08 series of amendments, shall be applied as follows:

Vehicle category	New type approvals (paragraph 12.1.2.)	Limit of validity of old type approvals (paragraph 12.1.3.)
N_3	1 October 1996	1 October 1998
M_2, M_3, N_2 > 7,5 tonnes maximum mass O_3 > 5 tonnes maximum mass	1 April 1998	1 April 2000
N_2 ≤ 7,5 tonnes maximum mass O_3 ≤ 5 tonnes maximum mass	1 April 1999	1 April 2001

12.3. Method of selection of the low adhesion surface for anti-lock testing

By way of derogation, Contracting Parties may grant approvals to this Regulation, as amended by the 08 or 09 series of amendments, before 1 January 1998, even if the requirements of annex 13 - appendix 4 to this Regulation are not fulfilled."

Annex 2,

Title of the annex, insert a reference to footnote **/ and a new footnote **/, reading:

**/ At the request of (an) applicant(s) for Regulation No. 90 approval, the information shall be provided by the Type Approval Authority as contained in appendix 1 to this annex. However, this information shall not be provided for purposes other than Regulation No. 90 approvals."

Insert new items 8.1. and 8.2., to read:

"8.1. Brake linings tested to all relevant prescriptions of annex 4 . . . . . .

8.2. Alternative brake linings tested to annex 15 . . . . . .

Item 13, amend to read:

"13. Mass of vehicle when tested:

	Unladen (kg)	Laden (kg)
king pin/supporting load 4/		
axle No. 1		
axle No. 2		
axle No. 3		
axle No. 4		
Total		

"

Insert a new item 14.5., by extending table 14 to cover documentation of the Type-III test:

"14.5. Type-III test 7/"

Items 14.5. to 14.10. (former), renumber as items 14.6. to 14.11.

Item 14.10.1. (former), renumber as item 14.11.1. and correct to read:

"14.11.1. The vehicle fulfils the requirements of annex 13: Yes/No 2/"

Item 14.10.2. (former), renumber as item 14.11.2.

Item 14.10.3. (former), renumber as item 14.11.3. and the reference to footnote 7/ to read 8/.

Insert a new item 14.12., to read:

"14.12. Vehicle is equipped with a control line(s) according to paragraphs 5.1.3.1.1. / 5.1.3.1.2. / 5.1.3.1.3. 2/"

Footnote 4/ to item 13, amend to read:

"4/ In the case of a semi-trailer or a centre-axle trailer, enter the mass corresponding to the load on the coupling device."

Footnote 6/ to item 14.3., amend to read:

"6/ Applies only to vehicles of categories O_2 and O_3."

Insert a new footnote 7/ to item 14.5., to read:

"7/ Applies only to vehicles of category O_4."

Footnote 7/ (former) to item 14.11.3. (new), renumber as footnote 8/.

Insert a new Appendix 1, to read:

"Annex 2 - Appendix 1

LIST OF VEHICLE DATA FOR THE PURPOSE OF REGULATION No. 90 APPROVALS

1. Description of the vehicle type . . . . . .
1.1. Trade name or mark of the vehicle, if available . . . . . .
1.2. Vehicle category . . . . . .
1.3. Vehicle type according to Regulation No. 13 approval . . . . . .
. . . . . .
1.4. Models or trade names of vehicles constituting the vehicle type, if available . . . . . .
. . . . . .
1.5. Manufacturer's name and address . . . . . .
2. Make and type of brake linings
2.1. Brake linings tested to all relevant prescriptions of annex 4 . . .
. . . . . .
2.2. Brake linings tested to annex 15 . . . . . .

3. Minimum mass of vehicle . . . . . .
3.1. Distribution of mass of each axle (maximum value) . . . . . .
4. Maximum mass of vehicle . . . . . .
4.1. Distribution of mass of each axle (maximum value) . . . . . .
5. Maximum vehicle speed . . . . . .
6. Tyre and wheel dimensions . . . . . .
7. Brake circuit configuration (e.g. front/rear or diagonal split) . . . . . .
8. Declaration of which is the secondary braking system . . . . . .
9. Specifications of brake valves (if applicable) . . . . . .
9.1. Adjustment specifications of the load sensing valve . . . . . .
9.2. Setting of pressure valve . . . . . .
10. Designed brake force distribution . . . . . .
11. Specification of brake . . . . . .
11.1. Disc brake type (e.g. number of pistons with diameter(s), ventilated or solid disc) . . . . . .
11.2. Drum brake type (e.g. duo servo, with piston size and drum dimensions) . . . . . .
11.3. In the case of compressed air brake systems, e.g. type and size of chambers, levers, etc. . . . . .
12. Master cylinder type and size . . . . . .
13. Booster type and size . . . . . .

_____"

Annex 3,

In the examples of the Arrangements of approval marks, Models A, B and C, amend the approval number "082439" to read "092439" and in the caption pertinent to Model A, amend the approval number "082439" to read "092439" and the wording "08 series of amendments" to read "09 series of amendments".

Annex 4,

Insert new paragraphs 1.2.8. to 1.2.10., to read:

"1.2.8. For electric vehicles with motor(s) permanently connected to the wheels, all tests will be carried out with the motor(s) connected.

1.2.9. For electric vehicles as described in paragraph 1.2.8., fitted with an electric regenerative braking system of category A, behaviour tests defined in paragraph 1.4.3.1. of this annex shall be carried out on a track with a low adhesion coefficient (as defined in paragraph 5.2.2. of annex 13).

1.2.9.1. Moreover, for vehicles fitted with an electric regenerative braking system of category A, transient conditions as gear changes or accelerator control release shall not affect the behaviour of the vehicle in condition of tests described in paragraph 1.2.9.

1.2.10. During the tests specified in paragraphs 1.2.9. and 1.2.9.1., wheel locking is not allowed. However, steering correction is permitted if the angular rotation of the steering control is within 120° during the initial 2 seconds and not more than 240° in total."

Insert a new paragraph 1.5.1.6., to read:

"1.5.1.6. For electric vehicles not having sufficient autonomy to carry out the cycles of heating of the brakes, the tests shall be carried out from the specified speed during the first braking application and after that by using the maximum acceleration capability of the vehicle, and braking successively from the speed reached at the end of each cycle with a duration specified for the relevant category of vehicle."

Paragraph 1.5.2.1., amend to read:

"1.5.2.1. The service brakes of trailers of categories O_2 and O_3 must be tested ...."

Insert a new paragraph 1.5.3.1.2., to read:

"1.5.3.1.2. For electric vehicles fitted with an electric regenerative braking system of category A, during brake applications, the highest gear shall be continuously engaged and the separate electric regenerative braking control, if any, shall not be used."

Paragraph 1.5.3.1.2. (former), renumber as paragraph 1.5.3.1.3.

Insert a new paragraph 1.5.3.3., to read:

"1.5.3.3. In the case of electric vehicles having carried out the brake heating cycles according to paragraph 1.5.1.6. of the present annex, the performance tests shall be carried out at the maximum possible speed which could be reached by the vehicle at the end of the brake heating cycles. For comparison, the Type-0 test with the cold brakes shall be repeated from this same speed, after reconditioning of the linings."

Paragraph 1.6.1., amend to read:

"1.6.1. Laden power-driven vehicles must be tested ... gear engaged (*) and the retarder ... by the manufacturer."

(*) Note: The text placed in brackets and reading "(if the vehicle is power-driven)" is being deleted.

Paragraph 1.6.3, amend to read, and correct the symbol "dm" to read "d_m" (twice):

"1.6.3. At the end ... may be different). This not performance must give a stopping distance not exceeding ..."

(Note): The last section of paragraph 1.6.3. reading "However ... wheel load." has to be deleted.)

Insert a new paragraph 1.7., to read:

"1.7. Type-III test (fade test for vehicles of category O_4)

1.7.1. Track Test

For the road test the conditions shall be as follows:

number of brake applications:	20
duration of a braking cycle:	60 s
initial speed at the beginning of braking:	60 km/h
braking applications:	In these tests, the force applied to the control must be so adjusted as to attain the mean fully developed deceleration of 3 m/s^2 in respect to the trailer mass P_R at the first brake application; this force must remain constant throughout the succeeding brake applications.

The braking rate of a trailer is calculated according to the formula given in paragraph 1.4.5.3. of Regulation No. 13, annex 4:

$$z_R = (z_{R+M} - R) \cdot \frac{(P_M + P_R)}{P_R} + R$$

The speed at the end of braking (annex 11, appendix 2, paragraph 3.1.5.):

$$v_2 = v_1 \cdot \sqrt{\frac{P_M + P_1 + P_2/4}{P_M + P_1 + P_2}}$$

where:

z_R - braking rate of the trailer
z_{R+M} - braking rate of the vehicle combination (motor vehicle and trailer)
R - rolling resistance value = 0,01
P_M - total normal static reaction between the road surface and the wheels of towing vehicle for trailer (kg)
P_R - total normal static reaction between the road surface and the wheels of trailer (kg)
P_1 - part of the mass of the trailer borne by the unbraked axle(s) (kg)
P_2 - part of the mass of the trailer borne by the braked axle(s) (kg)
v_1 - initial speed (km/h)
v_2 - final speed (km/h)

1.7.2. Hot performance

At the end of the test according to paragraph 1.7.1., the hot performance of the service braking system must be measured under the same conditions as for the Type-0 test with, however, different temperature conditions and starting from an initial speed of 60 km/h. The hot brake-force at the periphery of the wheels must then not be less than 40 per cent of the maximum stationary wheel load, and not less than 60 per cent of the figure recorded in the Type-0 test at the same speed."

Paragraph 2.1.2., at the end of the first subparagraph insert the following text:

"..... However, in the case of category M_1 vehicles, the minimum combination performance shall be not less than 5.4 m/s^2 both in laden and unladen conditions.
....."

Paragraph 2.2.1., correct the symbol "dm" to read "d_m" (three times).

Insert new paragraphs 2.2.6. to 2.2.6.2., to read:

"2.2.6. For electric vehicles, the performances for the two following additional failures shall be checked:

2.2.6.1. For a total failure of the electric component of the service braking;

2.2.6.2. In the case where the electric component delivers the maximum braking force when a failure of the electric transmission occurs."

Paragraph 2.3.6., amend to read:

"2.3.6. To check compliance with the requirement specified in paragraph 5.2.1.2.4. of this Regulation, a Type-0 test must be

carried out with the engine disconnected at an initial test speed of 30 km/h. The mean fully developed deceleration on application of the control of the parking brake system and the deceleration immediately before the vehicle stops shall not be less than 1.5 m/s^2. The test shall be carried out with the laden vehicle. The force exerted on the braking control device shall not exceed the specified values."

Paragraph 2.4.1., the table, delete the brackets enclosing he numerical values of mean fully developed deceleration (m/s^2) (twelve times).

Paragraph 3.1.2.2., amend to read:

"3.1.2.2. If the trailer is fitted with a compressed-air braking system, the pressure in the supply line shall not exceed 7 bar during the brake test and the signal value in the control line shall not exceed the following values, depending on the installation:

(a) 6.5 bar in the pneumatic control line;

(b) a digital demand value corresponding to 6.5 bar (as defined in ISO/DIS 11992:[1996]) in the electric control line.

The test speed is 60 km/h. A supplementary test at 40 km/h shall be carried out with the laden trailer for comparison with the Type-I test result."

Paragraphs 3.1.3.1. and 3.1.3.2., amend to read:

"3.1.3.1. If the service braking system is of the continuous or semi-continuous type, the sum of the forces exerted on the periphery of the braked wheels shall be at least x per cent of the maximum stationary wheel load, x having the following values:

full trailer, laden and unladen	50
semi-trailer, laden and unladen	45
centre-axle trailer, laden and unladen	50

3.1.3.2. If the trailer is fitted with a compressed air braking system, the pressure in the control line must not exceed 6.5 bar and the pressure in the supply line must not exceed 7.0 bar during the brake test. The test speed is 60 km/h."

Insert new paragraphs 3.1.3.3. and 3.1.3.4., to read:

"3.1.3.3. In addition, the vehicles must undergo the Type-III test.

3.1.3.4. In the Type-III test of a semi-trailer, the mass braked by the latter's axle(s) must correspond to the maximum axle load(s)."

Paragraph 3.3.1., amend to read:

"3.3.1. The automatic braking performance in the event of a failure, as described in paragraph 5.2.1.18.3. of this Regulation, when testing the laden vehicle from a speed of 40 km/h, shall not be less than 13.5 per cent of the maximum stationary wheel load. Wheel-locking at performance levels above 13.5 per cent is permitted."

Annex 5,

Amend the title, to read:

"Type-IIA TEST"

Insert a new paragraph 1, to read:

"1. The provisions of this annex apply to the following vehicles:

(a) interurban motor coaches and long-distance touring motor coaches of category M_3

(b) vehicles of category N_3 which are authorized to tow a trailer of category O_4. If the maximum mass exceeds 26,000 kg, the test mass is limited to 26,000 kg or - in the case where the unladen vehicle mass exceeds the mass of 26,000 kg - this mass is to be taken into account by calculation."

Paragraphs 1 and 2 (former), renumber as paragraphs 2 and 3.

Annex 6,

Paragraph 2.5., amend to read:

"2.5. In the case of power-driven vehicles having a pneumatic control line for trailers .... (remaining text unchanged)."

Paragraph 2.6., amend to read:

"2.6. The time elapsing from the initiation of brake-pedal actuation to the moment when

(a) the pressure measured at the coupling head of the pneumatic control line,

(b) the digital demand value in the electric control line measured according to ISO/DIS 11992:[1996].

reaches x per cent of its asymptotic, respectively final, value shall not exceed the times shown in the table below:"

(table unchanged)

Paragraphs 3.1., 3.2. and 3.3., amend to read:

"3.1. The trailer's response times shall be measured without the power-driven vehicle. To replace the power-driven vehicle, it is necessary to provide a simulator to which the coupling heads of the supply line, the pneumatic control line and/or the connector of the electric control line are connected.

3.2. The pressure in the supply line shall be 6.5 bar.

3.3. The simulator for pneumatic control lines shall have the following characteristics:"

Insert a new paragraph 3.5., to read:

"3.5. The simulator for electric control lines shall have the following characteristics: 1/"

Provide a new footnote for paragraph 3.5., as follows:

"1/ Until uniform test procedures have been agreed, trailers with an electric control line shall be deemed to meet the requirements of paragraph 3 of this annex when the accompanying pneumatic control line fulfils the prescribed requirements."

Annex 7,

A. COMPRESSED-AIR BRAKING SYSTEMS

Paragraph 1.2.2.3., amend to read:

"1.2.2.3. In the case of power-driven vehicle to which the coupling of a trailer is authorized and with a pneumatic control line, the supply line shall be stopped and a compressed-air reservoir of 0.5 litre capacity shall be connected directly to the coupling head of the pneumatic control line. Before each braking operation, the pressure in this compressed-air reservoir shall be completely eliminated. After the test referred to in paragraph 1.2.1. above, the energy level supplied to the pneumatic control line shall not fall below a level equivalent to one-half the figure obtained at the first brake application."

Paragraph 1.3.2.4., amend to read:

"1.3.2.4. At each brake application, the pressure in the pneumatic control line shall be 7.5 bar."

Insert a new paragraph 1.3.2.5., to read:

"1.3.2.5. At each brake application, the digital demand value in the electric control line shall be corresponding to a pressure of 7.5 bar."

Paragraph 5.2.2.17., footnote 9/, correct the words "electronic braking system" to read "electric control transmission".

Annex 8,

Paragraph 2.3., amend to read:

"... braking system control. Similarly, once applied, the spring brakes must not release unless there is sufficient pressure in the service braking system to at least provide the prescribed residual braking performance of the laden vehicle by application of the service braking control. This paragraph does not apply to trailers."

Paragraph 2.4., amend to read:

"... In the case of trailers, it must be possible to release the brakes at least three times after the trailer has been uncoupled, the pressure in the supply line being 7.5 bar before the uncoupling. However, prior to the check the emergency brake shall be released. These conditions must be satisfied ..."

Paragraph 2.5., amend the initial pressure value "6.5 bar" to read "7.0 bar".

Paragraph 2.6., amend to read:

"2.6. When the pressure in the line feeding energy to the spring compression chamber - excluding lines of an auxiliary release device using a fluid under pressure - falls to the level at which the brake parts begin to move, an optical or audible warning device shall be actuated. Provided this requirement is met, the warning device may comprise the red warning signal specified in paragraph 5.2.1.29.1.1. of this Regulation. This provision does not apply to trailers."

Annex 9,

Paragraph 2.6., amend to read:

"2.6. When the pressure in the locking chamber approaches the level at which mechanical locking occurs, an optical or audible warning device shall come into action. Provided this requirement is met, the warning device may comprise the red warning signal specified in paragraph 5.2.1.29.1.1. of this Regulation. This provision shall not apply to trailers.

In case of trailers, ... (remainder unchanged)"

Annex 10,

Paragraphs 1. and 1.1., amend paragraph numbering to read:

"1. GENERAL REQUIREMENTS

1.1. Vehicles of categories .... this must operate automatically.

However, vehicles - other than those of category M_1 - which are equipped with an anti-lock system as defined in annex 13, shall also meet the requirements of paragraphs 7 and 8 of this annex if they are in addition fitted with a special automatic device which controls the distribution of braking among the axles. In the event of failure of its control, it shall be possible to stop the vehicle as stipulated under paragraph 6 of this annex."

Insert a new paragraph 1.2., to read:

"1.2. The requirements relating to the diagrams specified in paragraphs 3.1.5., 3.1.6., 4.1., 5.1. and 5.2. of this annex, are valid both for power-driven vehicles with a pneumatic control line according to paragraph 5.1.3.1.1. of this Regulation and for power-driven vehicles with an electric control line according to paragraph 5.1.3.1.3. of this Regulation. In both cases, the reference value (abscissa of the diagrams) will be the value of the transmitted pressure in the control line: for vehicles equipped according to paragraph 5.1.3.1.1. of this Regulation, this will be the actual pneumatic pressure in the control line (p_m); for vehicles equipped according to paragraph 5.1.3.1.3. of this Regulation, this will be the pressure corresponding to the transmitted digital demand value in the electric control line, according to ISO/DIS 11992:[1996]. Vehicles equipped according to paragraph 5.1.3.1.2. of this Regulation (with both pneumatic and electric control lines) shall satisfy the requirements of the diagrams related to both control lines. However, identical braking characteristic curves related to both control lines are not required."

Paragraph 3.1.3., amend to read:

"3.1.3. In the case of a power-driven vehicle authorized to tow trailers of category O_3 or O_4 fitted with compressed-air braking systems.

3.1.3.1. When tested with the energy source stopped, the supply line blocked off, a reservoir of 0.5 litre capacity connected to the pneumatic control line, and the system at cut-in and cut-out pressures, the pressure at full application of the braking control shall be between 6.5 and 8.5 bar at the coupling heads of the supply line and the pneumatic control line, irrespective of the load condition of the vehicle.

3.1.3.2. For vehicles equipped with an electric control line; a full application of the control of the service braking system shall

provide a digital demand value corresponding to a pressure between 6.5 and 8.5 bar (see ISO/DIS 11992:[1996]).

3.1.3.3. These values shall be demonstrably present in the power-driven vehicle when uncoupled from the trailer. The compatibility bands in the diagrams specified in paragraphs 3.1.5., 3.1.6., 4.1., 5.1. and 5.2. of this annex, should not be extended beyond 7.5 bar and/or the corresponding digital demand value (see ISO/DIS 11992:[1996])."

Renumber existing paragraph 3.1.3.2. as 3.1.3.4.

Insert a new paragraph 3.1.4.3., to read:

"3.1.4.3. For electric vehicles fitted with an electric regenerative braking system of category B, where the electric regenerative braking capacity is influenced by the electric state of charge, the curves shall be plotted by taking account of the electric regenerative braking component under the minimum and maximum conditions of delivered braking force. This requirement is not applicable if the vehicle is equipped with an antilock device which controls the wheels connected to the electric regenerative braking and shall be replaced by the requirements of annex 13."

Paragraph 3.1.5.1., amend to read:

"3.1.5.1. In the case of a power dri en vehicle authorized to tow trailers of category 03 or 04 fitted with a compressed air braking system, the permissible relationship between the braking rate T_M/P_M and the pressure p_m shall lie within the areas shown on diagram 2 of this annex for all pressures between 0.2 and 7.5 bar."

Paragraph 3.1.6.3., amend to read:

"3.1.6.3. In the case of a vehicle fitted with a compressed air braking system, the permissible relationship between the braking rate T_M/P_M and the pressure p_m shall be within the areas shown on diagram 3 of this annex for all pressures between 0.2 and 7.5 bar."

Paragraph 4.1.1., amend to read:

"4.1.1. The permissible relationship between the braking rate T_R/P_R and the pressure p_m shall lie within two areas derived from diagrams 4A and 4B for all pressures between 0.2 and 7.5 bar, in both the laden and unladen states of load. This requirement shall be met for all permissible load conditions of the semi-trailer axles."

Paragraph 5.1.3., amend to read:

"5.1.3. The permissible relationship between the braking rate T_R/P_R and the pressure p_m shall lie within the designated areas in diagram 2

of this annex for all pressures between 0.2 and 7.5 bar, in both the laden and unladen states of load."

Paragraph 5.2.1., amend to read:

"5.2.1. The permissible relationship between the braking rate T_R/P_R and the pressure p_m shall lie within two areas derived from diagram 2 of this annex, by multiplying the vertical scale by 0.95. This requirement shall be met at all pressures between 0.2 and 7.5 bar, in both the laden and unladen states of load."

Insert a new paragraph 7.5., to read:

"7.5. Electronically controlled brake force distribution systems that cannot fulfil the requirements of paragraphs 7.1., 7.2., 7.3. and 7.4. above shall have a self checking procedure of the functions which influence brake force distribution."

Diagrams 2, 3 and 4A, Note "1." should be deleted and Note "2." renumbered as Note "1.". Further, the shading should be deleted, below values "$T_M/P_M = 0.1$" and "$T_R/P_R = 0.1$", as appropriate.

Annex 11,

The title, amend to read:

"CASES IN WHICH TYPE-I AND/OR TYPE-II (OR Type-IIA) OR TYPE-III TESTS DO NOT HAVE TO BE CARRIED OUT"

Paragraph 1, amend to read:

"1. Type-I and/or Type-II (or Type-IIA) or Type-III tests need not ... cases:"

Paragraph 1.1.1., amend to read:

"1.1.1. has passed the Type-I and/or Type-II (or Type-IIA) or Type-III test; and"

Paragraph 1.2., amend to read:

"1.2. The vehicle .... has individually passed the Type-I and/or Type-II (or Type-IIA) or Type-III test for masses ..... axle."

Paragraph 3.1., amend to read:

"3.1. In the case .... subjected to the Type-I and/or Type-II (or Type-IIA) or Type-III test of reference shall be entered."

Annex 11, Appendix 1, Table III, amend to read:

"

Reference axle ..... Report No. ..... Date ..... (copy attached)			
	Type-I		Type-III
Energy absorbed per axle (N) (see paragraph 4.2.1., appendix 2) Axle 1 Axle 2 Axle 3	 T_1 = ... % P_e T_2 = ... % P_e T_3 = ... % P_e		 T_1 = ... % P_e T_2 = ... % P_e T_3 = ... % P_e
Predicted actuator stroke (mm) (see paragraph 4.3.2., appendix 2) Axle 1 Axle 2 Axle 3	 s_1 = ... s_2 = ... s_3 = ...		 s_1 = ... s_2 = ... s_3 = ...
Average output thrust (N) (see paragraph 4.3.3., appendix 2) Axle 1 Axle 2 Axle 3	 Th_{A1} = ... Th_{A2} = ... Th_{A3} = ...		 Th_{A1} = ... Th_{A2} = ... Th_{A3} = ...
Braking performance (N) (see paragraph 4.3.5., appendix 2) Axle 1 Axle 2 Axle 3	 T_1 = ... T_2 = ... T_3 = ...		 T_1 = ... T_2 = ... T_3 = ...
	Type - 0 subject trailer test result (E)	Type - I hot (predicted)	Type - III hot (predicted)
Braking performance of vehicle (see paragraph 4.3.6., appendix 2)			
Hot braking requirements (see paragraphs 1.5.3., 1.6.3. and 1.7.2. of annex 4)		$\geq$ 0.36 and $\geq$ 0.60 E	$\geq$ 0.40 and $\geq$ 0.60 E

"

Annex 11, Appendix 2,

The title, amend to read:

"ALTERNATIVE PROCEDURES FOR TYPE-I AND TYPE-III TESTS FOR TRAILER BRAKES"

Paragraph 1.1., amend to read:

"1.1. In accordance with paragraph 1.4. of this annex, the Type-I or Type-III test may be waived at the time ...."

Paragraph 3.4.1.5., amend to read:

"3.4.1.5. Brake actuator stroke used during Type-O and Type-I or Type-III tests."

Paragraph 3.5.1.1., amend to read:

"3.5.1.1. This test is carried out at an initial speed equivalent to 40 km/h in the case of Type-I test and 60 km/h in the case of Type-III test in order to evaluate the hot braking performance at the end of Type-I and Type-III tests."

Paragraph 3.5.1.2., amend to read:

"3.5.1.2. Three brake applications are made at the same pressure (p) and at an initial speed equivalent to 40 km/h (in the case of Type-I test) or to 60 km/h (in the case of Type-III test), with .... performance."

Paragraph 3.5.3., amend to read:

"3.5.3. FADE TEST (TYPE-III TEST)

3.5.3.1. Test methods for repeated braking

3.5.3.1.1. Track Tests (see annex 4, paragraph 1.7)

3.5.3.1.2. Inertia Dynometer Test

For the bench test as in annex 11, appendix 2, paragraph 3.2., the conditions may be as for the road test according to paragraph 1.7.1. with:

$$v_2 = \frac{v_1}{2}$$

3.5.3.1.3. Rolling Road Dynometer Test

For the bench test as in annex 11, appendix 2, paragraph 3.3., the conditions shall be as follows:

Number of brake applications	20
Duration of braking cycle (braking time 25 s and recovery time 35 s)	60 s
Test speed	30 km/h
Braking rate	0.06
Rolling resistance	0.01

3.5.3.2. Not later than 60 seconds after the end of the Type-III test a hot performance test is carried out in accordance with paragraph 1.7.2. of annex 4 to this Regulation. The brake actuator pressure shall be that used during the Type-0 test."

Paragraph 4.2.1., amend to read:

"4.2.1. The brake forces (T) for each subject brake (for the same control line pressure p_m) necessary to produce the drag force specified for both Type-I and Type-III test conditions must not exceed the values T_e as stated in annex 11 - appendix 3, paragraphs 2.1. and 2.2., which were taken as a basis for the test of the reference brake."

Paragraphs 4.2.2. and 4.2.3., should be deleted.

Paragraph 4.3.3., amend to read:

"4.3.3. The hot performances following the Type-I or Type-III tests shall be determined ...."

Paragraph 4.3.5., the formula, amend to read:

$$T = (T_e - 0.01 \cdot P_e) \frac{(C - C_o)}{(C_e - C_{oe})} \cdot \frac{R_e}{R} + 0.01 \cdot P$$

Paragraph 4.3.7., amend to read:

"4.3.7. The hot performances following the Type-I or Type-III tests shall be determined in accordance with paragraphs 4.3.2., 4.3.3., 4.3.4. and 4.3.5. The resulting predictions given by paragraph 4.3.6. shall satisfy the requirements of this Regulation for the subject trailer. The value used for "the figure recorded in the Type-0 test as prescribed in paragraph 1.5.3. or 1.7.2. of annex 4", shall be the figure recorded in the Type-0 test of the subject trailer."

Paragraphs 4.4. to 4.4.2.4., should be deleted.

Annex 11, appendix 3, item 2, amend to read:

"2. RECORD OF TEST RESULTS 2/
(corrected to take account of rolling resistance → 0,01 . P_e)

2.1. In the case of vehicles of categories O_2 and O_3:

Test type:		O	I	
Annex 11, appendix 2, para.:		3.5.1.2.	3.5.2.2./3.	3.5.2.4.
Test speed	km/h	40	40	40
Brake actuator pressure p_e	bar		-	-
Braking time	min	-	2.55	-
Brake force developed T_e	N			
Brake efficiency $T_e/9,81P_e$	-			
Actuator stroke s_e	mm		-	
Camshaft input torque C_e	Nm		-	
$C_{o,e}$	Nm		-	

2.2. In the case of vehicles of category O_4:

Test type:		O	III	
Annex 11, appendix 2, para.:		3.5.1.2.	3.5.3.1.	3.5.3.2.
Test speed initial	km/h	60		60
final	km/h			
Brake actuator pressure p_e	bar		-	
Number of brake applications	-	-	20	-
Duration of braking cycle	s	-	60	-
Brake force developed T_e	N			
Brake efficiency $T_e/9,81P_e$	-			
Actuator stroke s_e	mm		-	
Camshaft input torque C_e	Nm		-	
$C_{o,e}$	Nm		-	

2/ Track Test/Inertia Dynamometer Test/Rolling Road Dynamometer Test (delete where not applicable)"

Annex 12,

Paragraph 2.2.22., amend to read:

"2.2.22. $2s_B^*$: Minimum brake shoe centre lift (minimum brake shoe application travel) (in millimetres) for wheel brakes with drum brakes

$$2s_B^* = 2.4 + \frac{4}{1000} \cdot 2r$$

2r being the diameter of the brake drum in millimetres; (see appendix 1, Figure 4, to this annex)

for wheel brakes with disc brakes with hydraulical transmission

$$2s_B^* = 1.1 \cdot \frac{10.V_{60}}{F_{RZ}} + \frac{1}{1000} \cdot 2r_A$$

where:

V_{60} = fluid volume absorption of one wheel brake at a pressure corresponding to a braking force of $1.2\ B^* = 0.6 \cdot G_{Bo}$ and a max. tyre radius.

and

$2r_A$ = outer diameter of brake disc.

(V_{60} in cm^3, F_{RZ} in cm^2 and r_A in mm)"

Insert new paragraphs 2.2.26. and 2.2.27., to read:

"2.2.26. D_A: Application force at input side of the control device, at which the overload protector is activated.

2.2.27. M_A: Braking torque at which the overload protector is activated."

Paragraph 2.4.3., amend to read:

"2.4.3. F_{RZ}: Surface area of piston of one wheel cylinder for drum brake(s); for disc brake(s), sum of the surface area of the caliper piston(s) on one side of the disc.

Insert a new paragraph 3.6., to read:

"3.6. Only inertia braking systems with disc brakes may incorporate overload protectors. They may not be activated at a force of less than 1.2 P or a pressure less than 1.2 p corresponding to a braking force of $B^* = 0.5 \cdot g \cdot G_{BO}$ (when fitted at the wheel brake) or at a thrust on the coupling less than 1.2 · D* (when fitted at the control device)."

Paragraph 6.2., amend to read:

"6.2. The braking torque M_{max} specified by the manufacturer shall be not less than that braking torque corresponding to 1.2 times the force P or 1.2 times the pressure p, required to give a braking force of $B^* = 0.5 \cdot g \cdot G_{BO}$.

6.2.1. In the case when no overload protector is neither fitted nor intended to be fitted within the inertia (overrun) braking system:

The wheel brake must be tested at 1.8 times the force P or at 1.8 times the pressure p, which is required to give a braking force of $B^* = 0.5 \cdot g \cdot G_{BO}$.

6.2.2. In the case when an overload protector is fitted or intended to be fitted within the inertia (overrun) braking system:

The wheel brake must be tested at 1.1 times the force P_{max} or P'_{max} or at 1.1 times the pressure p_{max} or p'_{max} of the overload protector including all tolerances (specified by the manufacturer)."

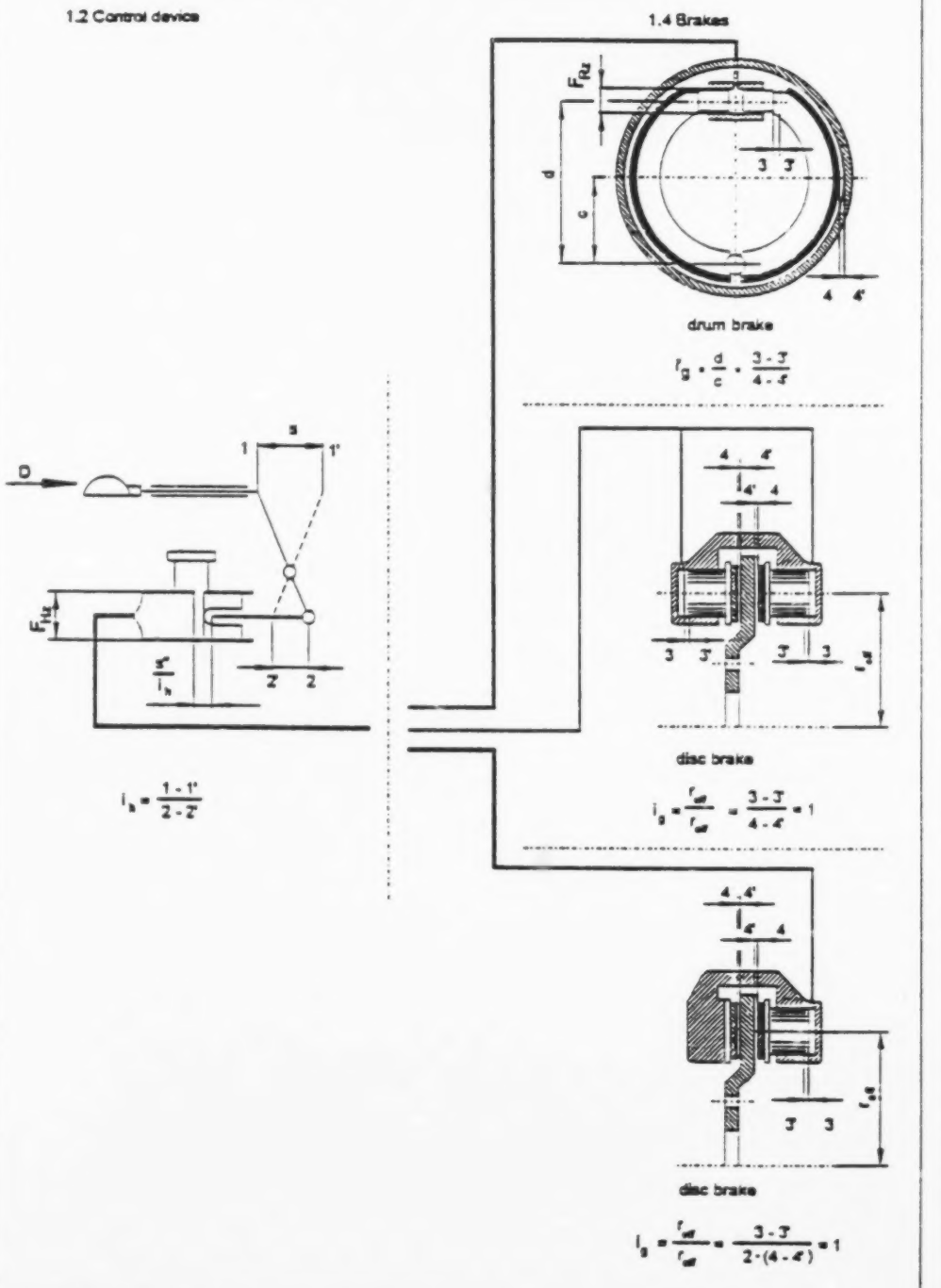
Paragraph 9.5.3., correct the word "undumped" to read "undamped".

Annex 12 - Appendix 1,

Figure 8 of appendix 1, replace by the following figure:

Figure 8: HYDRAULIC-TRANSMISSION BRAKING SYSTEM

(see paragraph 2.4)



Annex 12 - Appendix 2,

Insert a new item 9.8., to read:

"9.8. An overload protector according to paragraph 3.6. of this annex is provided / not provided 1/

9.8.1. If the overload protector is fitted before the transmission lever of the control device

9.8.1.1. Threshold force of the overload protector
D_A = ... N

9.8.1.2. where the overload protector is mechanical 1/
max. force P'_{max} which the inertia control device can develop
P'_{max}/i_{Ho} = ... N

9.8.1.3. where the overload protector is hydraulic 1/
max. hydraulic pressure which the inertia control device can develop
p'_{max}/i_h = ... N/cm²

9.8.2. If the overload protector is fitted after the transmission lever of the control device

9.8.2.1. Threshold force of the overload protector
where the overload protector is mechanical 1/ $D_A.i_{Ho}$ = ... N
where the overload protector is hydraulic 1/ $D_A.i_h$ = ... N

9.8.2.2. Where the overload protector is mechanical 1/
max force P'_{max} which the inertia control device can develop
P'_{max} = ...N

9.8.2.3. Where the overload protector is hydraulic 1/
max hydraulic pressure which the inertia control device can develop
P'_{max} = ...N/cm^2"

Annex 12 - Appendix 3,

The title, amend to read:

"TEST REPORT ON THE BRAKE"

Items 5 and 6, amend to read:

"5. Braking torque M_{max} = ... Nm
(as specified by the manufacturer according to paragraph 6.2. of this annex)

5.1. Tested braking torque = ... Nm
(according to paragraphs 6.2.1. and 6.2.2. respectively of this annex)

6. Dynamic tyre rolling radius
R_{min} = ... m; R_{max} = ... m"

Paragraphs 9.6. to 9.9.A., amend and/or insert to read:

"9.6. An overload protector according to paragraph 3.6. of this annex is / is not provided 1/

9.6.1. Braking torque activating the overload protector
M_A = ...Nm

9.7. Max. permissible force for M_{max}
P_{max} = ...N

9.6.A. An overload protector according to paragraph 3.6. of this annex is / is not provided 1/

9.6.1.A. Braking torque activating the overload protector
M_A = ...Nm

9.7.A. Max. permissible pressure for M_{max}
p_{max} = ...N/cm^2

9.8.A. Surface area of wheel cylinder
F_{RZ} = ...cm^2
p_{max} = ...N/cm^2

9.9.A. (for disc brakes)
Fluid volume absorption
V_{60} =.....cm^2"

Item 11, amend to read:

"11. The above brake does / does not 1/ conform to the requirements of paragraphs 3 and 6 of the testing conditions for vehicles fitted with inertia braking systems described in this annex.
The brake may / may not 1/ be used for an inertia braking system without an overload protector.

Signature: . . . . . "

Annex 12 - Appendix 4,

Item 4.7., amend to read:

"4.7. Dynamic tyre rolling radius R = ... m"

Items 5.1. to 5.3., amend to read:

"5.1. Stress threshold $100 \cdot K_A/(g \cdot G_A)$ = ... (must be between 2 and 4)

5.2. Maximum compressive force $100 \cdot D_1/(g \cdot G_A)$ = ... (must not exceed 10 for trailers with rigid drawbar, or 6.7 for multi-axled trailers with pivoted drawbar)

5.3. Maximum tractive force $100 \cdot D_2/(g \cdot G_A)$ = ... (must be between 10 and 50)"

Insert a new item 5.6., to read:

"5.6. Maximum braking torque of the brakes
$n \cdot M_{max}/(B \cdot R)$ = ... (must be equal or greater than 1.2)

5.6.1. An overload protector within the meaning of paragraph 3.6. of this annex is / is not 1/ fitted on the inertia control device / on the brakes 1/

5.6.1.1. where the overload protector is mechanical on the inertia control device 1/
$n \cdot P_{max}/(i_{H1} \cdot \eta_{H1} \cdot P'_{max})$ = ... (must be equal or greater than 1.0)

5.6.1.2. where the overload protector is hydraulic on the inertia control device 1/
P_{max}/P'_{max} = ... (must be equal or greater than 1.0)

5.6.1.3. if the overload protector is on the inertia control device:
threshold force D_A/D^* = ... (must be equal or greater than 1.2)

5.6.1.4. if the overload protector is fitted on the brake:
threshold torque $n \cdot M_A/(B \cdot R)$ = ... (must be equal or greater than 1.2)"

Items 5.6. to 5.7.4. (former), renumber as items 5.7. to 5.8.4.

Annex 13,

Paragraph 1.2., amend to read:

"1.2. .... a modulator or modulators. Any device of a different design which may be introduced in the future, or where an anti-lock braking function is integrated into another system, shall be deemed to be an anti-lock braking system ....."

Insert a new paragraph 2.7., to read:

"2.7. "Full cycling" means that the anti-lock system is repeatedly modulating the brake force to prevent the directly controlled wheels from locking. Brake applications where modulation only occurs once during the stop shall not be considered to meet this definition.

In the case of trailers with pneumatic braking systems, full cycling of the anti-lock braking system is only assured when the pressure available at any brake actuator of a directly controlled wheel is more than 1 bar above the maximum cycling pressure throughout a given test. The supply pressure available may not be increased above 8 bar."

Paragraph 4.1., add at the end the following text:

"4.1. .... The yellow warning signal specified in paragraph 5.2.1.29.1.2. shall be used for this purpose."

Paragraph 4.2., add at the end the following text:

"4.2. ... The separate yellow warning signals specified in paragraph 5.2.1.29.2. shall be used for this purpose, activated via pin 5 of the electrical connector conforming to ISO/DIS 7638:1996 */."

Paragraphs 4.2.1, 4.3., 4.4. and footnote 2/ should be deleted from Regulation No. 13, 08 series of amendments and the subsequent paragraphs renumbered as paragraphs 4.3., 4.4. and 4.5. and sub-paragraphs. The remaining footnotes should also be renumbered.

Paragraph 4.5. (former), renumbered as paragraph 4.3., amend to read:

"4.3. In the event of a failure in the anti-lock system, the residual braking performance shall be that prescribed for the vehicle in question in the event of a failure of part of the transmission of the service braking system (see paragraph 5.2.1.4. of this Regulation). This requirement shall not be construed as a departure from the requirements concerning secondary braking. In the case of trailers the residual braking performance in the event

---

*/ The ISO/DIS 7638:1996 connector may be used for 5 pin or 7 pin applications, as appropriate.

of a defect in the anti-lock system according to paragraph 4.1. shall be at least 80 per cent of the prescribed laden performance for the service braking system of the relevant trailer."

Paragraph 4.6. (former), renumbered as paragraph 4.4., amend to read:

"4.4. The operation of the anti-lock system shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by compliance with Regulation No. 10, 02 series of amendments."

Paragraph 4.7.2. (former), renumbered as paragraph 4.5.2., amend to read:

"4.5.2. an optical warning signal shall inform the driver that the antilock system has been disconnected or the control mode changed; the yellow anti-lock failure warning signal specified in paragraph 5.2.1.29.1.2. may be used for this purpose."

Paragraph 5.1.1.2., amend to read:

"5.1.1.2. From an initial speed of not less than 50 km/h, on a surface with a coefficient of adhesion of 0.3 7/ or less, the brakes of the laden vehicle shall be fully applied for a time t, during which time the energy consumed by the indirectly controlled wheels shall be taken into consideration and all directly controlled wheels must remain under control of the anti-lock system."

Paragraph 5.1.1.3., amend to read:

"5.1.1.3. The vehicle's engine shall then be stopped or the supply to the energy transmission storage device(s) cut off."

Paragraph 5.1.1.6., amend to read:

"5.1.1.6. During the tests, in the case of a power-driven vehicle authorized to draw a trailer equipped with a compressed-air braking system, the supply line shall be stopped and an energy storage device of 0.5 litre capacity shall be connected to the pneumatic control line - if fitted - (in accordance with paragraph 1.2.2.3. of annex 7A to this Regulation). When the brakes are applied for the fifth time, as provided in paragraph 5.1.1.5. above, the energy level supplied to the pneumatic control line shall not be below half the level obtained at a full application starting with the initial energy level."

Paragraph 6.1.2., amend to read:

"6.1.2. In the case of compressed air braking systems, the initial energy level in the energy transmission storage device(s) shall be equivalent to a pressure of 8.0 bar at the coupling head of the trailer's supply line."

Paragraph 6.1.3., amend to read:

"6.1.3. With an initial vehicle speed of at least 30 km/h the brakes shall be fully applied for a time t = 15 s, during which all wheels shall remain under control of the anti-lock system. During this test, the supply to the energy transmission storage device(s) shall be cut off.

If the time t = 15 s cannot be completed in a single braking phase, further phases may be used. During these phases no fresh energy shall be supplied to the energy transmission storage device(s) and, as from second phase, the additional energy consumption for filling the actuators is to be taken into account, e.g. by the following test procedure. ...."

Note 2/ at the end of annex 13 (pertinent to paragraph 4.4. of this annex), amend to read:

"2/ The wiring specification of paragraph 6.2. of ISO 7638-1985 for the trailer may only be reduced if the trailer is installed with its own independent fuse. The rating of the fuse shall be such that the current rating of the conductors is not exceeded.

With the exception of vehicles of categories N3 and O4, and until an international standard has been agreed, the electrical connection between towing vehicles and trailers equipped with a 12 V electrical system shall conform to DIN Standard 72570, Part 4."

Annex 13 - Appendix 2,

Paragraph 1.2.2., amend to read:

".... (z_{AL}) shall be measured with full cycling of the anti-lock braking system and based on the average value ...."

Paragraph 2.1.6., amend to read:

".... (z_{AL}) shall be measured with full cycling of the anti-lock braking system and the towing vehicle unbraked, based ...."

Footnote 7/, amend to read:

"7/ If the coefficient of adhesion of the test track is too high, preventing the anti-lock braking system from full cycling, then the test may be carried out on a surface with a lower coefficient of adhesion."

Footnote 9/, amend to read:

"9/ In the case of trailers equipped with a brake load sensing device, the pressure setting of the device may be increased to ensure full cycling."

Annex 15,

Paragraph 2.1.1., amend to read:

"2.1.1. It shall be capable of generating the inertia required by paragraph 3.1. of this annex, and have the capacity to meet the requirements prescribed by paragraphs 1.5., 1.6. and 1.7 of annex 4 to this Regulation with respect to Type-I, Type-II and Type-III tests."

Paragraph 2.1.4.2., correct to read:

"... during a stop, to a resolution not greater than ...."

Insert new paragraphs 4.6. to 4.6.3.2., to read:

"4.6. FADE TEST (TYPE-III TEST)

4.6.1. Test with repeated braking

4.6.1.1. Brake linings for trailers of category O_4, shall be tested according to the procedure given in paragraphs 1.7.1. and 1.7.2. of annex 4 to this Regulation.

4.6.2. Test with continuous braking

4.6.2.1. Brake linings for trailers of category O_4 shall be tested according to the procedure given in paragraph 1.7. of annex 4 to this Regulation.

4.6.3. Hot performance

4.6.3.1. On completion of the tests required under paragraphs 4.6.1. and 4.6.2. of this annex, the hot braking performance test specified in paragraph 1.7.4. of annex 4 to this Regulation shall be carried out.

4.6.3.2. The mean braking torque during the above hot performance tests on the linings being tested for the purpose of comparison shall, for the same input measurement, be within the test limits ± 15 per cent of the mean braking torque recorded with the brake linings conforming to the component identified in the relevant application for vehicle type approval."